PROC. ENTOMOL. SOC. WASH.
104(2), 2002, pp. 505–509

PSEUDOBRYOMIMA FALLAX (HAMPSON) AND *P. MUSCOSA* (HAMPSON) (LEPIDOPTERA: NOCTUIDAE) LEAF-MINING NOCTUIDS ON FERNS

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Abstract.—The genus *Pseudobryomima* includes three species, but these are probably congeners with the ten described species of *Properigea*. *Pseudobryomima fallax* (Hampson) was reared ex ovo on a fern, *Pellaea andromedifolia* (Kaulf.) Fée (Pteridaceae), and *P. muscosa* (Hampson) was reared on *Polypodium californicum* Kaulf. (Polypodiaceae) from field collected early instar larvae. Larvae began as blotch miners, but later instar larvae made shelters. The larva of *P. fallax* is described and illustrated.

Key Words: Lepidoptera, Noctuidae, Quail Ridge, California, cliff brake fern, Polypodiaceae, Pteridaceae, leaf miner

The three known species of *Pseudobryomima* Barnes and Benjamin are closely related to the ten described species of *Properigea* Barnes and Benjamin and may ultimately prove to be congeneric; all are exclusively Nearctic. None of the *Properigea* or *Pseudobryomima* has had their biology previously reported. We collected a female of *Pseudobryomima fallax* (Hampson) on the Quail Ridge Ecological Reserve, Vaca Mountains, Napa County, California, 38°29′20″N latitude and 122°08′14″W longitude, at an elevation of 440 meters. The species is illustrated by Hampson (1906: plate 105, fig. 8). The moth was retained for eggs.

On October 23, 1994, when the parental female moth was collected, we had dry fall conditions with relatively few plants that were still green. Under wet spring conditions the Quail Ridge site would have hosted several hundred available food plant candidates (anonymous 1993). The dry conditions led to the discovery of a food plant.

BIOLOGY

Upon eclosure, the first-instar larvae of *Pseudobryomima fallax* were offered a leaf from all the plants we could find in nearby Cold Canyon that were still green in November. The flora has been well documented for this region (Weathers et al. 1985, Hickman 1993). The first-instar larvae failed to feed on the following: *Achillea millefolium* L., *Aristolochia californica* Torrey, *Brickellia californica* (Torrey & Gray) A. Gray, *Ceanothus cuneatus* (Hook) Nutt., *Cercis occidentalis* Torrey, *Dryopteris arguta* (Kaulf.) Maxon, *Eriodictyon californicum* (Hook. & Arn.) Torrey, *Heteromeles arbutifolia* (Lindley) Roemer, *Lactuca* sp., *Lupinus albifrons* Benth., *Arctostaphylos manzanita* C. Parry, *Mimulus aurantiacus* Curtis, *Oxalis* sp., *Pinus sabiniana* Douglas, *Quercus douglasii* Hook. & Arn., *Rubus ursinus* Cham. & Schldl., *Salix* sp., *Sambucus mexicana* C. Pressl, and *Vitis californica Benth.* Fungi, lichens, and dead wood also were rejected. They fed only

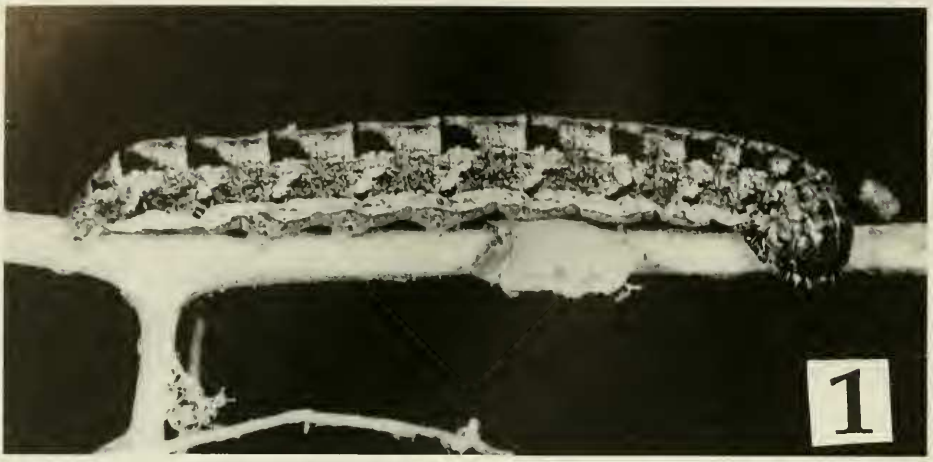


Fig. 1. *Pseudobryomima fallax*, mature larva.

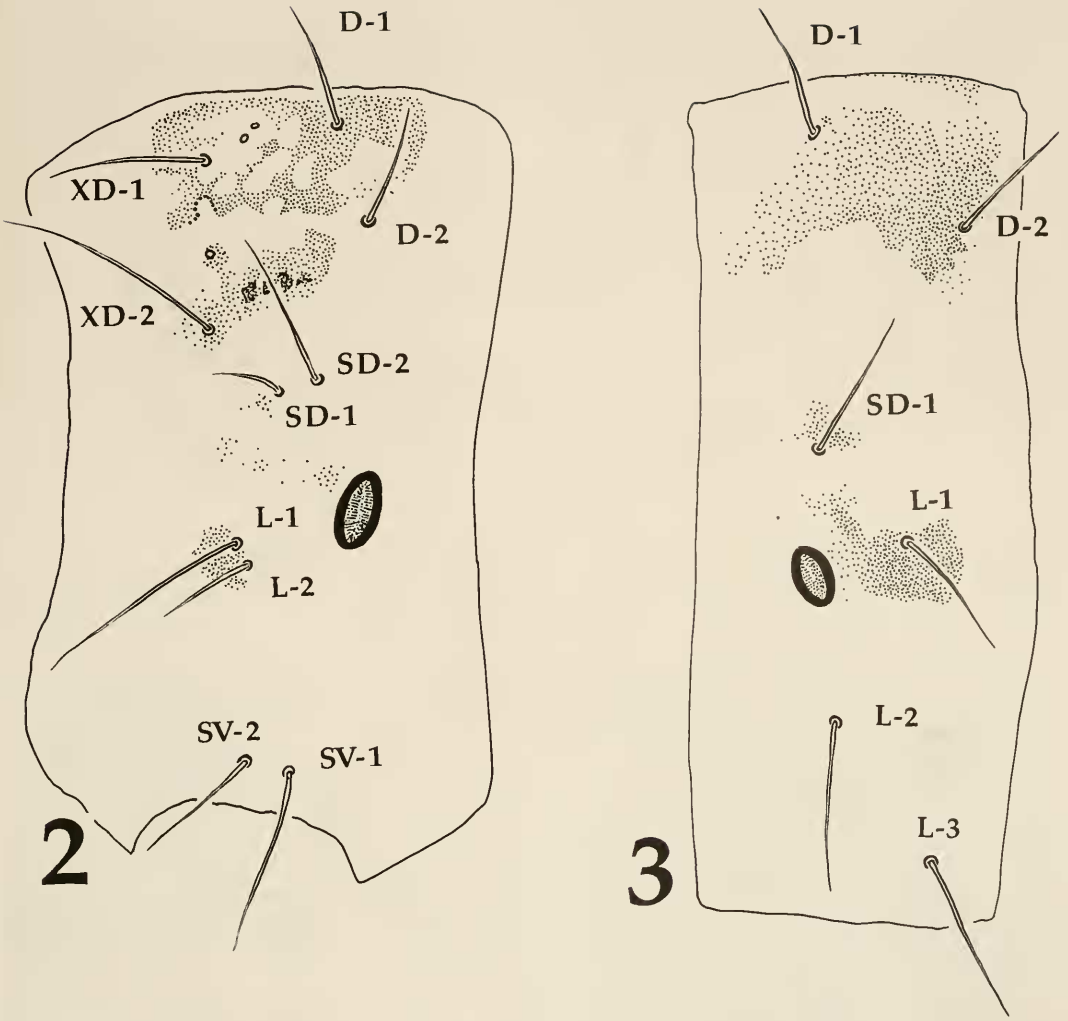
upon a cliff brake, *Pellaea andromedifolia* (Kaulf.) Fée (Pteridaceae). Last-instar larvae continued to reject higher plants from Quail Ridge, but accepted *Matteuccia struthiopteris* (L.) Todaro (Aspleniaceae) growing at the University of California, Davis, Arboretum—a fern neither native to California nor found at Quail Ridge. The first-instar larvae had rejected *Dryopteris* (Aspleniaceae) from Quail Ridge so the possibility existed that this fern specialist becomes more general in late instars, although *Dryopteris* was not offered to last-instar larvae.

The parental female of the reared brood was collected October 23, 1994. It oviposited the next day, and the ova eclosed after eight days. The first- and second-instars fed as a blotch miner, i.e., on the mesothelium of a fern pinna. Later instar larvae tied several pinnae and eventually whole fronds together and sheltered in the resulting chamber. We are unaware of any other noctuid that starts out as an internal leaf miner and switches to an external existence in a leaf shelter, although internal root- and stem-borers can start as leaf miners. The first mature larvae were acquired by December 16, 1994—the last matured by January 3, 1995.

On San Bruno Mountain (San Mateo Co., California) one of us (JD) found blotch miners on *Polypodium californicum* Kaulf. (Polypodiaceae) in 1982. Repeated visits over the next few years ultimately resulted in reared and identified adults in 1985. These were *Pseudobryomima muscosa* (Hampson).

With our discovery of the biology of two *Pseudobryomima* species, we now may be able to discover a fern specialty for *Pseudobryomima distans* (McDunnough). Subsequent to submitting this paper, one of us (TLM) visited Little St. Simon's Island in Georgia and got first-instar larvae of *Properigea tapeta* (Smith) to feed on resurrection-fern, *Polypodium polypodioides* (L.) Wyatt (Polypodiaceae). In the northeastern United States, one uncommon and localized *Properigea* species occurs in calcareous environs that also serves as *Pellaea* habitat.

Fern feeding is not commonplace among the Lepidoptera. Toxic compounds found in ferns deter herbivores. Only a few specialists, usually closely related, have been associated with these plants. It is so uncommon that the discovery of a fern host for *Pseudobryomima* suggests a closer relationship with some fern feeders than had been previously suspected. *Euplexia benesimilis* McDunnough shows a prediliction towards ferns; Palearctic *Conservula* is known from ferns; the host of *Iodepepla u-album* (Guenée) is unknown but fern is suspected. These species and *Pseudobryomima* share a



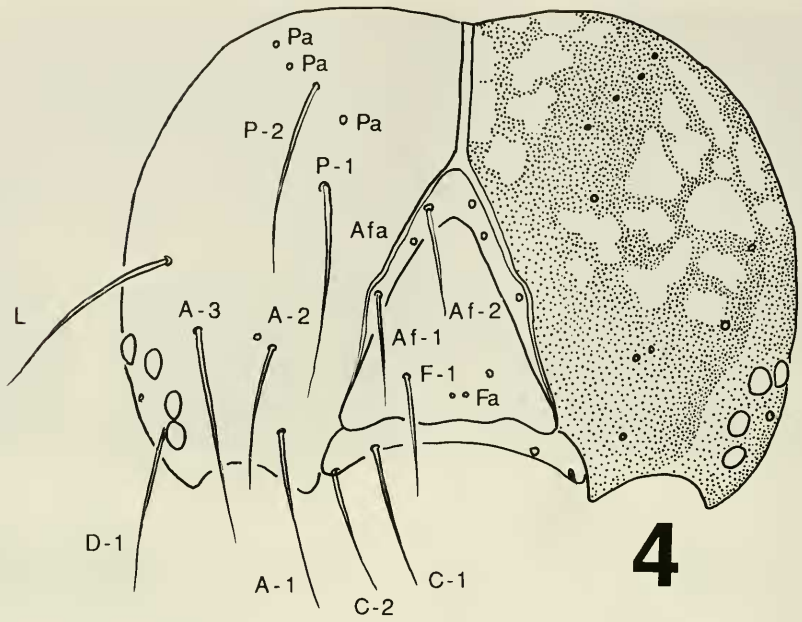
Figs. 2–3. *Pseudobryomima fallax*. 2, First thoracic segment, lateral view (anterior to left); ventral setae not shown. 3, First abdominal segments, lateral view (anterior to left); subdorsal setal base only (seta lacking, base reduced); subventral and ventral setae not shown. Abbreivations: D-1, D-2 = dorsal setae; XD-1 & 2 = primary setae; SD 1 & 2 = subdorsal setae; L1 & 2 = lateral setae; Sv-1 & 2 = subventral setae.

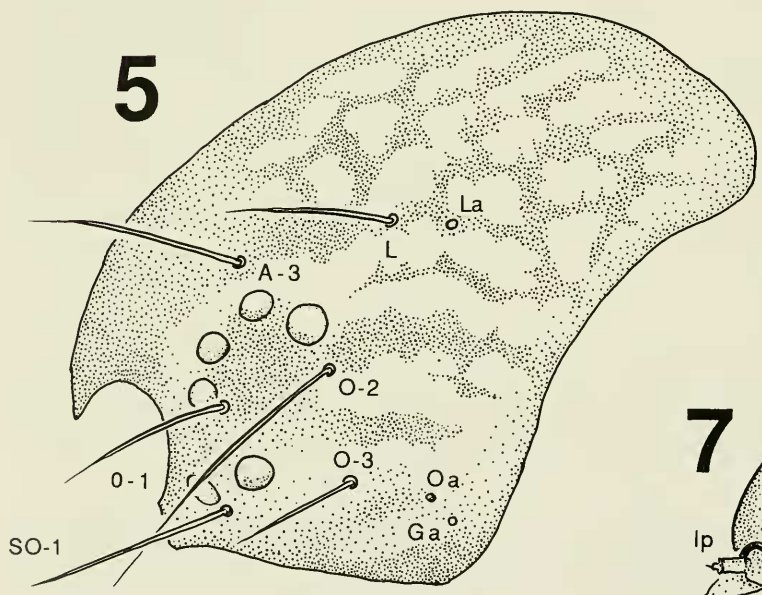
distinctive vesical feature, a bulbed cornutus bearing a rather long spine. *Callopistria* spp., *Fagitana littera* (Guenée), and several species of *Papaipema* have fern specialists, but appear to be more distant based on genitalic features. General feeders will sometimes tolerate ferns, particularly in the last instar.

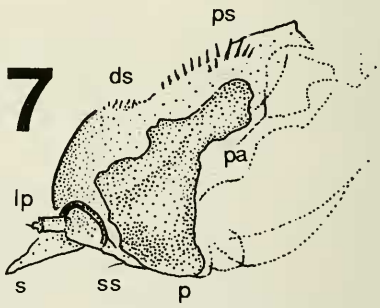
The parental female and preserved larvae are brood-coded "tlm 94-78." Preserved larvae are vouchered in the New York State Museum, the Bohart Museum, U.C. Davis, and the Essig Museum of Entomology, U.C. Berkeley.

Last Instar Larva of *Pseudobryomima fallax*

Description.—Gray brown with bold, black, subdorsal wedges connected across dorsum by a narrow black line along posterior margin of segment (Fig. 1). Below each subdorsal wedge a paler wedge that tapers to spiracle. Light brown spiracles partially imbedded in lateral dark markings







Figs. 4–7. *Pseudobryomima fallax*. 4, Head capsule, frontal aspect. Drawn to show setae and head pattern separately. For accurate ocellar arrangement see Fig. 5. 5, Head capsule, lateral aspect. 6, Oral face of left mandible showing mesal tooth. 7, Hypopharyngeal complex. Abbreviations: Pa = posterior head punctures; P-1 & P-2 = posterior head setae; L = lateral head seta; A1, 2 & 3 = anterior head setae; O-1 = ocellar seta; Af-1 & 2 = adfrontal setae; Afa = adfrontal puncture; F-1 = frontal seta; Fa = frontal puncture; C-1 & C-2 = clypeal setae. La = lateral puncture; L = lateral seta; A-3 = anterior head setae; O-1-3 = ocellar setae; Oa = ocellar puncture; Ga = genal puncture. Ps = proximolateral spines; Ds = distal spines; Lp = labial palpus; S = spinneret; Ss = stipular seta; P = prementum; Pa = premental arm.

(Figs. 1, 3). A broad, subspiracular, white stripe present. Integument smooth. Normal setae present; SD-2 (second subdorsal) setal base represented by a faint puncture on abdominal segments. Average body length 26 mm, but larvae probably undersized as a result of less than optimal rearing conditions. Head: Intricately patterned with light areas along frontal suture and on sides of head between coronal punctures and ocelli (Figs. 4, 5). Mandible: Three prominent teeth, fourth and fifth teeth as a low ridge. A large mesal tooth present (Fig. 6). Hypopharynx: Spinneret twice as long as labial palpus. Fine distal spines and an uneven row of 12 to 14 stout proximolateral spines present. Premental arm blunt posteriorly. Prolegs and crochets: Prolegs present and well developed on abdominal segments 3–6 and 10. Crochets average 29 on Abd-3; 30 on Abd-4; 32 on Abd-5; 32 on Abd-6; 36 on Abd-10; arranged in a uniordinal homoideous mesoseries (N = 14).

Acknowledgments

We thank Dr. Lynn Kimsey and Dr. Steve Heydon for extensive use of the facilities of the Bohart Museum of Entomology, University of California, Davis, during the fall and winter of 1994. We also thank Dr. Grady Webster of U.C. Davis for the fern determination, Ms. Patricia Kernan for the technical drawings, Mr. Frank Maurer of the Quail Ridge Wilderness Conservancy for encouraging the Lepidoptera survey and the University of California Natural Reserve System for permission to conduct the survey, and Ms. Carin Berolzheimer for permission to collect and accommodations on Little St. Simon's Island in Georgia. Collections of *P. muscosa* at San Bruno Mt. County Park were conducted with permits issued by the San Mateo County Park Department. Dr. J. D. Lafontaine and an anonymous reviewer made constructive comments on the manuscript.

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